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METHODS OF DETERMINING PUPIL READINESS FOR SPECIFIC UNITS OF INSTRUCTION PRESENTED THROUGH SIMULATED ENVIRONMENT MEDIA.

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BOARD OF COOPERATIVE EDUCATIONAL SERVICES

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THE METHODS FOR DETERMINING PUPIL READINESS WERE STUDIED TO DEVELOP CRITERIA FOR PUPIL PARTICIPATION IN SIMULATED ENVIRONMENT LEARNING UNITS. THE LEARNING UNITS WERE SUBPROJECTS OF COOPERATIVE RESEARCH PROJECT NUMBER 1948 (ED 003 024). EACH OF THREE UNITS IN THE PROJECT WAS EXAMINED FOR PUPIL READINESS. TEST BATTERIES WERE ASSEMBLED AND ADMINISTERED TO EXPERIMENTAL SUBJECTS TO ESTABLISH CUT-OFF SCORES FOR THE INDIVIDUALIZED INSTRUCTION CONDITIONS. (WN)

1104

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Methods of Determining Pupil Readiness for Specific Units of Instruction Presented Through Simulated Environment Media

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TABLE OF CONTENTS

		Page
Chapter I	Statement of the Problem	2
	Related Research	3
	Objectives	3
	Procedures	4
Chapter II	Results	8
	Music - clarinet unit	8
	Social Studies - Sumerian Game	11
	Physics - unit on light	12
Chapter III	Discussion	14
	Conclusions	14
	Recommendations	14
Appendices	A - Abstract, Project 1948	16
	B - Attitude Scale	17
	C - Excerpts from Project 2563: Testing and Statistical Procedures	21

Chapter I

Statement of the Problem. When we consider the range of ability, interests, academic achievement, and motivation within even a single classroom, and the computer-controlled, simulated-environment units of learning being prepared for tomorrow's pupils, it is evident that there is a need for careful matching of each pupil to the appropriate computer-controlled learning unit.

In order to assign a student to a learning unit at the proper time, the instructor, or computer program control, must know at least the following things about his pupil: his background of knowledge in the learning area, his aptitude for the work, and his attitude toward the indicated work. We also must have programed into the control unit many bits of information about the unit of work and the pupil-bits which the skilled teacher automatically reviews in this situation but which the machine will ignore unless we prepare specific instructions for these factors to be reviewed. For instance, we usually assume that the pupil is essentially normal in vision, hearing, general health, intellectual level, attitude toward school work in general and the specific unit of work in particular, emotional adjustment, and academic achievement prerequisite to an understanding of the unit, and enjoys freedom from any exceptional condition (such as brain damage or emotional disturbance) which would handicap him or completely thwart him in his efforts.

Both the unit of learning and the pupil must be analyzed in more detail than has been customary, for prerequisite background information. Ideally, every unit of learning will have these prerequisite items carefully specified, and the pupil will have taken an achievement test covering the same items, with appropriate remedial work completed before the new unit is attempted.

It will be useful to think of three stages of development in the testing process- the present experimental stage, an advanced experimental stage, and full automation. At present we must use much of current testing methods and existing tests, while eventually much of the testing will be built into the instructional program. An intermediate stage will exist when the simulated environment hardware is fully available, and the testing for readiness is being gradually incorporated into the program. We have the choice of constructing a test battery to be used as a pretest of the pupils' readiness for a new unit or building these prerequisite bits of information into the program as side loops in the main sequence, to be used by any pupil who needs them. When a complete series is available to take a pupil through all of elementary science, for instance, then the completion of each unit will serve as the prerequisite for the next unit unless skills from another discipline, not yet used in the science sequence, are needed.

The pupil's need for the unit of learning is often quite automatically determined once he has entered upon a major sequence or is taking a required course. However, for elective courses the need and desire to continue should be reviewed at the beginning of each major unit.

Aptitude for a particular course of instruction again is often assumed to be adequate if the pupil has attained the mental age at which the unit generally is taught, but there are some special aptitudes which most workers believe

to be different than the general intellectual factor; aptitude for music, art, and perhaps mathematics, for instance.

Readiness for the indicated work is a composite of all of these items already discussed, matching the prerequisites for the course to the pupil's level of development and freedom from pertinent handicaps. There will obviously be a range of acceptable scores on each of these measures, from the minimum at which we expect the student to be successful, to a maximum above which (in some instances) the student would already know the information in the unit, or would be bored with the work. If the student is outside the acceptable range of scores in any one of the items, this should be the signal for consultation with a teacher, and appropriate remediation, or adjustment of his program.

We will have two categories of IBM data files. The first will contain the records of individual students, and the second will contain the detailed prerequisites for each unit of work to be presented to the students via simulated environment media. Data processing will consist of comparing these two categories of information, and whenever a student does not possess all of the prerequisites for the contemplated work, the machine must be instructed to print out all of the information about the student which is pertinent to the unit of instruction, with a special mark calling attention to all items which do not meet the criteria. At the present stage of development of machine-controlled learning, a teacher must then review the data, deciding what to do about the unmet criteria. For the future development of automated instruction, a case file of such decisions should be established. When sufficient data has accumulated, it is probable that the answers to some frequent problems may be built into the program.

Related Research. There is to our knowledge no research dealing directly with the problem of this study.

There is much literature in the area of testing for achievement, aptitude, and intelligence, though more work is needed in constructing tests which give detailed results and specific descriptions of achievement. Diagnostic achievement tests come closest, in supplying scores for parts of complex performances.

Much has been written on the subject of educational guidance, but it is not in a form suitable for this problem.

Data processing procedures have been used to record and reproduce test data. Roe and Moon have described a method for analyzing curricula, suggesting a detailed breakdown of the usual blocks of subject matter into smaller units and have discussed the problem of instructing a computer to make decisions about which students should be studying which bits of learning and at what time.

Some research has been done in the field of programed instruction and in simulated techniques. Some of these studies are represented in Coulson's book Programed Learning and Computer-Based Instruction.

Objectives. One objective of this study is to build upon the knowledge which we have of testing techniques and recording methods in order to produce detailed

and specific description of subjects who will undertake instruction via simulation and to devise ways of interpreting this description.

Another purpose of this project is to make a pilot study of the procedures needed to determine when a student is ready to engage in learning activities through the use of simulated environment media.

Specific objectives are these:

a. to organize test batteries suitable for use in determining the readiness of pupils for Project 1948 units in music, The Sumerian Game, and elementary physics. The original intent was to use the Project 1948 units in music, chemistry, and French, but delays in the development of the units in French and chemistry, and this investigator's time schedule, necessitated the changes noted.

b. to administer these predictive batteries, and to compare the results obtained with them with the results of tests administered at the end of the learning units.

c. to assemble and organize the test results in a logical and meaningful pattern.

d. to design a data processing card for the recording of the test results.

e. to devise a technique for translating the recorded test data into instructions for matching the student with a suitable learning program.

f. to generalize about the preceding steps and provide a rationale for the design of a more comprehensive and detailed study, and,

g. to draw up a proposal to be submitted later under Title VII.

Procedures. We started with basic information about the individual students, gathered from the schools' cummulative records, the health records, and some items not ordinarily found in such records, gathered through interview. This information was entered on an IBM master card for a student. Trailer cards carry additional, more detailed information, and data needed for each particular unit of study.

At this stage of development, data processing also is simulated. A plan for the recording of necessary data has been worked out, with a master card and trailer cards for each student. Prerequisites for a successful learning experience are developed on the basis of collaboration between the investigator and the teacher-researchers in Project 1948. The two sets of data are then matched to determine individual pupil readiness for the specific unit of instruction presented through the simulated environment medium.

A possible lay-out for the master card follows. Many other arrangements

would work just as well. The major requirement is that all necessary data be included either in the master card or one of the trailer cards.

Field	Item	Columns
1	Student Number	5 : 1-5
2	Card code	2 : 6, 7
3	Name: last, blank, first	20 : 8-27
4	Birth date: month, day, year	6 : 28-33
5	Grade placement	2 : 34, 35
6	I.Q. (from trailer card 03)	3 : 36-38
7	M.A. (I.Q. x C.A./100)	3 : 39-41
8	Date M.A. calculated (month & year)	4 : 42-45
9	Health (0 = all items within normal range. 1 = see card 02)	1 : 46
10	Attitude toward machine learning "EASE" score - 1 = very favorable 2 = somewhat favorable 3 = undecided 4 = somewhat unfavorable 5 = very unfavorable	1 : 47
11	Teacher's judgment of student's usual degree of effort. 1 = excellent To 5 = very poor	1 : 48
12	Teacher's judgment of stability (1-5)	1 : 49
13	Summary of attendance record	
	A. % attendance to date this year	2 : 50, 51
	B. days absent during past 10 school days	1 : 52

As experience accumulates, this list will undoubtedly be modified and expanded, but this provides a point of departure, and includes in combination with the trailer cards, the data usually reviewed about a student before new work is assigned.

Trailer cards would be set up as required, such as --

Card Code	Data to be entered
02	Health - vision, hearing, motor coordination, etc. Include all items which could be an educational handicap.
03	Intellectual ability - Record all scores as standard scores with mean 100 and standard deviation 15. Average the three most recent, but reject any score more than 15 points below the average of the rest. Transfer the result to the master card, columns 36 - 38.
04	Achievement - reading tests
05	" - language arts, English
06	" - social studies
07	" - mathematics, basic processes
08	" - science
09 - 12	" - subject areas as needed
13	Student's program plan
14	Aptitudes - music, art, manual dexterity, mechanical, etc.
15	Interests - informal survey, Kuder, Strong, etc.
16	Personality factors - stability, motivation

In discussion with the teacher-researchers in Project 1948, it became obvious that much needed information about students is common to all learning situations, while some is specific to each particular unit.

Suggestions for a basic battery of information useful to know about all students in many learning areas includes items such as CA, MA and IQ, all periodically kept up to date, and less common items such as visual acuity and perception, auditory acuity and perception, social and cultural factors, language development - perhaps as measured by the Illinois Test of Psycholinguistic Abilities, memory span, the ability to form abstract concepts, detailed break-down of the I.Q. such as primary mental abilities, or subtests of other multi-score or factored tests, etc.

As pupils became available for units in Project 1948, their cumulative records from their local schools were examined for pertinent data, and other testing as needed was done. The EASE attitude scale was used both pre- and post experiment, on the assumption that a pupil who had consented to be an experimental subject would have formed a tentative attitude toward simulated

environment learning. Pupils become experimental subjects for a great variety of reasons, and if we had one who had come unwillingly, his attitude could have invalidated the experiment for him. As the work progressed, it appeared that this was a questionable assumption, perhaps due to the nature of the attitude scale. See Appendix B.

As the various units of Project 1948 waxed and waned, and the time schedule of the principle investigator for this project meshed with the other, the original intent to study readiness for chemistry, French, and music changed to a study of music, elementary science, and elementary economics.

In music, the unit was on clarinet instruction at an advanced level. The task presented was to learn to interpret an original composition as the composer intended it to be played.

The elementary science unit on light underwent revision during the time of this study, and includes more instruction in the final form than the original.

The elementary economics lesson is presented through a game involving ancient Sumer, and develops the concepts of supply and demand, the law of diminishing returns, etc., as well as a thoroughly researched presentation of life in ancient Sumer.

General and specific prerequisites for each of these academic areas were discussed with the teacher-researchers involved, and tentative standards were decided upon. As sizeable numbers of pupils go through the experimental programs, each one who passes the readiness standards but fails the experiment by taking excessive time or being completely frustrated, will be carefully studied for the purpose of revising the standards of readiness.

Chapter II

Results.

MUSIC

(In collaboration with Dr. Don Nuccio, Head of the Music Department, Somers Schools, Somers, New York, and teacher-researcher, Project 1948).

The subproject in music in Project 1948 has two levels of instruction - beginning clarinet, and an advanced level in which the pupil learns to play and interpret an original composition by Thomas Briccetti, The Herb and The Jude, for flute, clarinet, and piano.

Prerequisites for the advanced level unit, from the master card, are:

1. Grade placement — 10.0 or above
2. Mental age — 12.0 or above
3. General health — OK, (or if any impairment, must not interfere with holding the instrument in playing position or normal breath control).
4. Attitude toward machine learning: 1, 2, or 3
5. Teacher's judgment of effort (1 - 3)
6. Teacher's judgment of stability (1 - 3)

From the trailer cards, the following items are required:

7. Reading achievement: 9.0 or above
8. Vision (acuity and perception) normal (or if any impairment, adequate at about 20" to read music and instructions from machine).
9. Hearing (acuity and perception) normal or better
10. Arm reach - mouth to right thumb in playing position: 18" or more
11. Finger pads - 5/16" or more across
12. Interest patterns - Kuder music at 25th percentile or above
13. Music aptitude - Wing music test - 10th percentile or better for age
14. Music achievement - Watkins - Farnum Performance Scale - grade 3.0 or better

Two pupils participated in the experiment, and their reports follow -

Pupil Readiness for Clarinet Instruction
via Simulated Environment

In the preliminary experiments, we have used applicable scores available in the school records rather than repeat testing which has already been done. The time available for testing was limited because the subjects are all unpaid volunteers.

SUBJECT A

Age 16, going into eleventh grade in the Fall, with both public school and private lessons on the clarinet, seven years total experience.

Intelligence. Group test I.Q.'s range from 133 to 135 in elementary school, and on The Wechsler Intelligence Scale for Children, administered in February 1962, his scores are Verbal I.Q. 123

Performance I.Q. 128

Full Scale I.Q. 128

Reading ability. N.E.D.T. 3/63 (10th grade)

English and Reading scores all 93rd percentile or better

Attitude toward simulated environment learning.

Pretest -- somewhat favorable

Posttest-- very favorable

(The Campbell EASE Test)

Interest in Music

Participation has been steady for several years.

Kúder Preference Record, Vocational--

Music is in the average range: he does not plant to make this his means of livelihood.

Aptitude for Music: The H. D. Wing Test of Musical Intelligence--

Tests 1-3 (aptitude)--A (in top 10%)

Tests 1-7 (aptitude plus appreciation)-B-one point under the A rating

The Watkin's-Farnum Performance Scale, Form A

Score. 3½

This subject is obviously ready for the experiment, which is done with music designed to be of a difficulty suitable for students of considerably less talent and experience. He was successful in his performance.

SUBJECT B

Age 16, entering 12th grade in the Fall. Has had public school music for five years, and ten lessons of private instructions.

Intelligence. Group test I.Q.'s range from 113 to 122. Wechsler I.Q. 121, with Performance better than Verbal I.Q., administered 2/62.

Reading Ability. ITED, 11th grade, Reading-Social Studies 24th percentile.

Reading-Nat. Science 81, Literature 51, and General Vocabulary 63.

Attitude Toward Simulated Environment Learning.

Pretest -- somewhat favorable

Posttest-- very favorable

(Campbell EASE Test)

Interest in Music. Participation is high and enthusiastic.

Kuder Preference Record - Music - 99th percentile

(He plans to become a public school teacher (secondary major music).

Aptitude for Music: The H. D. Wing Test of Musical Intelligence.

Test 1-3 (aptitude)-C (average)

Test 1-7 (aptitude) and appreciation)-C(average)

The Watkins-Farnum Performance Scale, Form A

Score 3

Subject B, while not as gifted according to test scores, obviously has higher motivation, and did as well or better than Subject A.

Referring back to Objective b. "with the results of tests administered at the end of the learning units," it became evident that the experimental learning unit was of such short duration in itself that no measurable growth would take place in the readiness test battery scores, and therefore it would be meaningless to repeat the same tests. Instead of this, we were concerned with whether or not the readiness test battery was able to predict success for the students in the experiment. For these two students, the prediction was accurate

SOCIAL STUDIES-THE SUMERIAN GAME

(In collaboration with Mrs. Mabel Addis, teacher in the Katonah-Lewisboro Schools, and teacher-researcher, Project 1948).

The Sumerian Game has a two-fold objective - to teach the elementary principles of economics, and to teach some ancient history. Very little is presented in the usual text books on ancient Sumer, but in this game, pupils are given a carefully-researched picture of an early civilization in which these principles of economics would be discovered by the pupil via simulation of the real life situation. Details of Sumerian life have been verified by consultation with the leading authorities. The game is tentatively set at the sixth grade level.

In the Sumerian Game, the pupil plays the part of the priest-ruler of a city-state in ancient Sumer. He controls the food supply; allotting a certain number of bushels of the harvest to feeding the people, some to planting, and some to storage, and is then informed by the computer of the results of his decisions. By manipulating the proportions of the harvests allotted to various uses, from season to season, and being given the results of each decision, the pupil is to discover for himself the basic principles of economics in a simulated situation similar to the real situation of so long ago.

Prerequisites for the Sumerian Game are, from the master card -

1. grade placement 6.0 to 6.9
2. mental age 12.0 or higher
3. health normal, or if not, no handicap specific to this situation
4. EASE score 1, 2, or 3
5. effort 1, 2 or 3, or SEE TEACHER
6. stability - ditto
7. attendance record - if poor, SEE TEACHER from Card 02 - Health - any pertinent handicaps (vision and hearing must be within normal limits, or compensated, and absence of brain damage resulting in impaired ability to form abstract concepts).

   from Card 04 - Reading

   Vocabulary 6.0 or higher

   Comprehension 6.0 or higher

   Rate 6.0 or higher

   from Card 06 - Social Studies - economics - a pretest on the concepts to be taught is <u>failed</u>.

from Card 07 - Mathematics

addition and subtraction @ 4.0 or above

understands concept of ratio.

from Card 13 - pupil's program

Sumerian Game is listed

from Card 15 - Kuder Preference Record. Voc.

Computational 10th percentile or higher

Scientific " " " "

Social Service " " " "

The Sumerian Game is partially programed for the IBM computer and has been tried out. A machine terminal is installed at the BOCES Research Center. The game will be programed further, and more pupils will try the game.

Each pupil will be studied for the prerequisites noted above, and if he does not pass all items, note made of this to determine whether or not the cut off point was set too high. If he passes all prerequisites and still fails on the game, careful study of his scores will be made to see if the prerequisites need revision. For example, it may be that a mental age of 13.0 or higher is required for a reasonable chance of success on the game. Perhaps some ability is actually needed which is not listed among the prerequisites. Only actual try-out of many pupils will give the answers to these speculations.

ELEMENTARY PHYSICS - UNIT ON LIGHT

(In collaboration with Mrs. Mary Robinson, Science Coordinator, Yorktown Elementary Schools, and teacher-researcher, Project 1948).

In this unit, fifth or sixth grade pupils learn several concepts about light, starting with simple ideas, and working up to more complex ones: properties of light, laws of reflection, and velocity of light. A variety of audio and visual stimuli are used to illustrate the concepts.

Several "Control Points" are built into the program. These are test questions on the previous material - if the pupil gives the right answer, he is assumed to have understood the lesson so far, and he has passed the "prerequisite" to proceed. If he fails this control point question, he is given additional explanations of the concept being presented until he does answer correctly. For a record of each pupil's progress, every control point response is recorded by the IBM machine.

There is no Control Point at the very beginning of the unit - this is taken care of in the prerequisites for readiness.

Prerequisites for this unit are similar to the other two in the general items. Items specific to this unit are:

On Card 07 - Mathematics: The ability to solve the equation for the velocity of light, in word problem form rather than the abstract, algebraic form.

On Card 08 - Science: a rudimentary understanding of the solar system

On the pretest of content for the unit - a score of "slow."

Chapter III

Discussion. As this study progressed, and various workers were involved in discussing the basic assumptions of this approach, it became evident that there could be two approaches to how best to determine pupil readiness for learning through simulated environment media. The first is to provide that some degree of formal appraisal of readiness should be carried out for each pupil before he attempts a new major unit of work. The other is to build testing for readiness into the early stages of a program of learning, and therefore the pre-testing is not necessary. To use only the latter would subject some students to frustration, loss of time, and the probable building of poor attitudes toward simulated environment learning, as well as necessitating much duplication of effort to build this readiness testing into each new unit of work. Both approaches can be useful under varying circumstances.

Referring back to the Objectives, f. and g. are incorporated into the new Project 2563, as shown in Appendix C. The major disadvantage of this project was the fact that the time schedule could not fully allow for revisions in the time schedule and progress of Project 1948. Therefore, rather than prepare a separate proposal, and attempting again to match the time schedules of two independent Projects, it was deemed preferable to incorporate the testing and the statistical procedures in the main Project.

Conclusions. It is evident that a much more detailed analysis of the academic prerequisites for new units of study is required than was previously thought desirable. One marvels at the store of information held in mind and reviewed by a good teacher about each child; the readiness prerequisites for new work.

This has implications for teacher training. Teachers should develop the habit of scanning and matching a great deal of information about their pupils and the work which the pupils are expected to do. Unless this is systematized, many teachers will ask pupils to attempt work for which they are not ready, or which is not necessary for that pupil.

Readiness for reading has been carefully studied and the concept widely accepted. However, the same concept of readiness for each new stage of learning in all subject areas and at all levels is not as well studied nor as well accepted by all teachers as it should be. This study has shown that prerequisites and readiness can be measured for various levels of learning. A fairly safe generalization from this study would seem to be that detailed prerequisites for particular units of work and criteria for pupil readiness for these units can be developed for any subject at any level. Preliminary thinking about the other five units of Project 1948, and discussions with the teacher-researchers involved also supports this conclusion. It is also evident that rather large scale data and trials of matching pupils to units of work will be needed to refine the early, arm-chair criteria. Some pupils will be frustrated or bored with units of learning during this process, but without this approach, they would have been anyway, and they will be contributing to more accurate specifications for pupils to follow.

Recommendations for further research. Thinking about a problem as new as this

produces many more questions than answers.

It is apparent that much detailed information about each pupil is required if he is not to be lost in the masses of children going through our schools. High speed data processing can handle a great deal of information, economically processing and analyzing much more than can be managed by earlier methods. But what are the most efficient ways of processing the data, and which data yield the most helpful information? These are matters for future investigation.

Each person's manner of approach to problems is a characteristic of his personality, and is exemplified by the Rorschach test scores W and D: does the individual approach problems globally, seeing the whole first, or building up concepts gradually, detail by detail? Are differences in this dimension related to success and failure, ease and frustration in handling computer-based instruction? Undoubtedly learning sequences can be presented utilizing both approaches, but unless this is consciously planned for, the lucky students will be those whose manner of approach matches that of the designer of the unit of learning to which he is subjected.

The point has perhaps been over-stressed, but as an IBM data processor remarked, a computer is just a very fast moving idiot--it cannot reason or know that necessary information is missing. Therefore, we must supply it with detailed, specific information about both children and courses of study, and provide for matching of all pertinent items, before the very rapid data processing now available can be effective. Extremely detailed analysis of students who possess all of the programed and tested prerequisites, but who nevertheless fail to learn as anticipated, should provide the clues and information necessary to revise the early attempts to measure all of the pertinent factors and to set the cut off points at optimum levels.

It seems likely that with the masses of information about children which will be gathered in the process of studying automated instruction, that with pre-planning and subsequent analysis of this information, some of the developmental theories may be verified, modified, or proven false.

A final recommendation is that when enough readiness testing has been done and tried on students, the data can easily be processed to determine the optimum level at which the various units of instruction should be placed.

APPENDIX A

ABSTRACT, Project 1948

APPLICATION TO THE COMMISSIONER OF EDUCATION, OFFICE OF EDUCATION
U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, FOR FUNDS
TO SUPPORT A COOPERATIVE RESEARCH PROJECT UNDER THE
PROVISIONS OF PUBLIC LAW 531, 83rd CONGRESS

Title: Use of Technical Media for Simulating Environments to Provide Individualized Instruction

Submitted by: The Board of Cooperative Educational Services
First Supervisory District
Westchester County, New York

Initiated by: Richard L. Wing
Coordinator of Curriculum Research

Definition: The term "simulated environment mode" is here intended to designate a technique designed to provide the individual student with a substitute for the pertinent features of a natural or conventional learning situation and to perform the tutorial functions of a teacher within that setting. This simulation structure is realized through the appropriate selection, organization, and manipulation of stimulus materials and the use (ultimately) of audio-video display and response devices backed up with technical resources for the storage, retrieval, and processing of information.

Objectives: The aims of the proposed investigation are to make an exploratory study of the simulated environment mode in the teaching of certain units in chemistry, biology, elementary science, French, social studies, music and art at several different grade levels; to construct a rationale for the use of simulation; to speculate about further applications of the mode with reference to present technologies of education as well to future technologies; and to prepare the materials, techniques and evaluation devices for further experimentation.

Procedure: During the past summer in a workshop conducted jointly by the Board of Cooperative Educational Services and the ASDD branch of IBM ten teachers started constructing brief units in the subjects mentioned above using simulation techniques. Trials will be made of these materials as they are completed during the winter of 1962-63 and after revision during the following summer. Drawing upon information gathered from the participants in these projects through interviews, attitude scales, and student tests, the investigator will make an analysis of ways in which simulation techniques appeared to be useful.

APPENDIX B

EXPLORING ATTITUDES TOWARD SIMULATED ENVIRONMENT (EASE)

Definition:

The SIMULATED ENVIRONMENT method of learning is designed to give you a substitute for the important parts of the ordinary classroom experience. This is done by using a complicated machine which can perform such tasks as showing slides, films, TV programs and playing records and tapes. It presents the subject material, tests your answers, and allows you to go ahead at your own speed. For instance, a science lesson might need some hard to get equipment and by means of simulation this equipment would be shown on the machine.

Directions:

We would like to know how you FEEL about the simulated environment technique. We want you to answer each item as honestly as you can. We ask you NOT to write your name on these sheets for it is only your truthful answers that are important - it does not matter who gives the answers.

Please circle the response which corresponds the closest to your feeling about each item.

SA = Strongly Agree
A = Agree
U = Uncertain
D = Disagree
SD = Strongly Disagree

Do not take too much time in thinking about any particular item. Please do not leave any item out - there is no right or wrong answer - it is just how YOU feel about things. Other people may have different opinions.

Here are a couple of examples:

(SA) A U D SD x. The game I like to watch on TV is baseball.

If you like baseball the best of all games you watch on TV you would put a circle around SA for you strongly agree with the statement.

Now you try the next one.

SA A U D SD y. Strawberry ice cream is one of my favorite ice cream flavors.

Put a circle around the letter which comes closest to representing your feeling. Even if your exact feeling is not found in one of the choices pick the one which comes the closest to your true feeling.

Now do the rest the same way. Sometimes it will be hard to make up your mind, but do the best you can and do not leave any out.

SA A U D SD 1. In general, I think the simulated environment technique is worthwhile.

SA A U D SD 2. I feel that it would be very hard to really learn something using the simulated environment method.

SA A U D SD 3. The simulated environment technique is O.K. but my regular classroom method is better.

SA A U D SD 4. The simulated environment method gives a student a chance to get something done that is worthwhile.

SA A U D SD 5. I would like to continue using the simulated environment technique in my regular classes.

SA A U D SD 6. Just mentioning the simulated environment technique gets me mad.

SA A U D SD 7. It seems that the simulated environment technique is kind of useless.

SA A U D SD 8. I feel that the simulated environment method is much better than having a "human teacher".

SA A U D SD 9. I hate using the simulated environment method.

SA A U D SD 10. I dislike the simulated environment technique because I have little control over it.

SA A U D SD 11. I am enthusiastic about the simulated environment method.

SA A U D SD 12. I believe that the simulated environment technique is very confusing.

SA A U D SD 13. I am against using the simulated environment technique in most school subjects.

SA A U D SD 14. I think the simulated environment method is very enjoyable.

SA A U D SD 15. In my opinion, a student cannot learn much by using the simulated environment technique.

SA A U D SD 16. If I were principal of our school, I would have the simulated environment method put into that school.

SA A U D SD 17. If I could do anything I wanted to do on Saturday mornings, I would come into school and use the simulated environment technique to learn.

SA A U D SD 18. It seems that time really flies when a student is using the simulated environment method.

SA A U D SD 19. It seems that the simulated environment technique is a lot of fun.

SA A U D SD 20. I feel that most students would associate such words as "revolting" and "disgusting" with the simulated environment technique.

SA A U D SD 21. It seems that being in a simulated environment learning situation is very unpleasant.

SA A U D SD 22. Public schools should provide the simulated environment technique for all their pupils.

SA A U D SD 23. The whole simulated environment method would bother me.

SA A U D SD 24. I think the simulated environment method is boring.

SA A U D SD 25. I dislike the simulated environment technique.

SA A U D SD 26. The simulated environment method helped me much more than a regular teacher.

SA A U D SD 27. The simulated environment method is one of the best things I have seen in schools.

SA A U D SD 28. When I am supposed to be learning using the simulated environment method I am usually thinking about other things.

SA A U D SD 29. I like the feeling of being on my own when using the simulated environment method.

SA A U D SD 30. The simulated environment method has little value when compared with the usual way I have been taught.

SA A U D SD 31. I feel that it is really amazing how much you can learn by using the simulated environment technique.

SA A U D SD 32. I feel lost as there isn't an actual teacher there when I am using the simulated environment technique.

SA A U D SD 33. I believe that being able to have the material repeated at your command is one of the great advantages of the simulated environment technique.

SA A U D SD 34. I feel that the simulated environment method is like a friend.

SA A U D SD 35. I think it's really neat the way the simulated environment method works.

SA A U D SD 36. The simulated environment technique is for the birds.

SA A U D SD 37. I have a low regard for the simulated environment technique.

SA A U D SD 38. Students can really learn a lot using the simulated environment method.

SA A U D SD 39. I think the simulated environment method is bad for students.

SA A U D SD 40. I feel that the average student would be dumbfounded if he had to really learn something using the simulated environment technique.

SA A U D SD 41. I believe that I could be proud of my accomplishments using the simulated environment technique.

SA A U D SD 42. I like the idea of simulated environment.

SA A U D SD 43. In my opinion, students should <u>not</u> be required to use the simulated environment method in the schools.

SA A U D SD 44. I wish that all my courses next year were taught by the simulated environment technique.

In general my attitude toward using the simulated environment method of learning is:

1. Very favorable
2. Somewhat favorable
3. Undecided or don't know
4. Somewhat unfavorable
5. Very unfavorable

APPENDIX C

Measurement. Variables in each instructional program will consist of the experimental variable, namely, the use of technical media for simulating environments to provide individualized instruction, dependent variables, and other independent variables as follows:

Dependent variables to be measured by

Standardized achievement tests.
Teacher-made tests of achievement constructed for the project.
Measures of attitudes toward the process and technique (experimental groups only).
Time required to earn assigned content and skills.
Analysis of student responses stored in computer.

Independent variables as measured by

Intelligence tests.
General achievement measures, such as course grades.
Reading tests.
Personality measures.

Statistical Procedures. Statistical procedures will include those necessary for item analysis and determination of reliability and validity of tests developed for the project. Since outcomes, as measured, of dependent variables will in most instances be "gains", pretesting and posttesting will be required. Also, since an objective is to determine differential effects of other independent variables, regression and covariance analysis will be used.